VESDA ECO Test Gas Guide

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VESDA ECO™ by xtralis™

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Document Conventions

The following typographic conventions are used in this document.

Convention	Description
Bold	Used to denote: emphasis Used for names of menus, menu options, toolbar buttons
Italics	Used to denote: references to other parts of this document or other documents. Used for the result of an action

The following icons conventions are used in this document.

Convention	Description
	Caution: This icon is used to indicate that there is a danger to equipment. The danger could be loss of data, physical damage, or permanent corruption of configuration details.
	Warning: This icon is used to indicate that there is a danger of electric shock. This may lead to death or permanent injury.
	Warning: This icon is used to indicate that there is a danger of inhaling dangerous substances. This may lead to death or permanent injury.

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Contents

Warning 1

Scope 1

Overview 1

Sensor life 2

- **Routine testing/calibration** 3
- **Zero calibration** 4
- **Span calibration** 4
- **Oxygen detectors** 4
- **Calibration procedure** 4
- **Toxic gas detectors** 4
- **Flammable gas detectors** 4
- **Test/calibration/test gas cylinders** 4
- **Calibration / test gas suppliers** 5

Warning

Before using any test / calibration gas; reference should be made to supplier Material Safety Data Sheets (MSDS) for all safety recommendations.

Always ensure there is sufficient ventilation to prevent ingestion of potentially harmful levels of test gas or the build-up of potentially hazardous concentrations.

Ensure that ceiling spaces and voids are adequately ventilated when using gases that are lighter than air.

Ensure low lying areas (inspection pits, floor voids, basements etc.) are adequately ventilated when using gases that are heavier than air.

ALWAYS ADHERE TO LOCAL HEALTH AND SAFETY REGULATIONS WHEN HANDLING HAZARDOUS GASES.

Scope

This document provides an overview of suitable test/calibration equipment required to conduct routine response checks or calibration of VESDA ECO gas detectors along with contact details of potential test gas suppliers.

Overview

VESDA ECO adds gas detection capability to existing or new installations of VESDA Aspirating Smoke Detection (ASD) systems that typically utilize 25mm or ¾" BSP air-sampling pipe networks.

The VESDA ECO can detect a range of flammable gases, toxic gases and oxygen deficiency.

Each VESDA ECO detector houses a replaceable sensor cartridge which can contain one or two gas sensors.

VESDA ECO uses the same well proven core sensing technologies that have been successfully used by the gas detection industry for many years. (see Table 1)

VESDA ECO currently employs three core sensing principles: Catalytic bead (often referred to as Pellistors) for the detection of flammable gases. Electrochemical cells for the detection of toxic gases and for oxygen deficiency. Infrared for the detection of carbon dioxide.

The majority of gas sensors have a finite life (see Table 1). Sensor life is dependant on the type of sensing principle, any internal chemistry and the environmental conditions it is exposed to.

This makes it difficult to precisely predict the end of life for any gas sensor. With the exception of the oxygen deficiency detector and the infra red detecting principle used for carbon dioxide; these sensing technologies are not failsafe. That is to say; they do not provide any indication when the operating life has expired.

Routine (typically 6 monthly) exposure to test/calibration gas is recommended for all gas types to verify gas sensor response and re-validate the accuracy of gas concentration readings.

The test/calibration process requires the use of a zero gas and a span gas. Zero gas (e.g. clean air for flammable gas detectors, Nitrogen for toxic gas and Oxygen deficiency detectors), plus span gas e.g. a known concentration; (typically 50% of full scale); of the target gas to be detected.

Sensor life

The life of a toxic gas electrochemical cell is related to the working life of its internal chemistry and is typically 24 months.

Oxygen fuel cells consume their internal chemistry during normal operation, their life can be measured in ppm hours based on an ambient of 20.9 % v/v and have a typical life in excess of 18 months.

Ammonia cells have a life of 18-24 months, this assumes they are operating in an environment free of any background concentration of Ammonia.

The life of flammable gas sensors that use catalytic beads can be many years; typically greater than three years. Their life is directly related to the amount of catalytic poisons they are exposed to.

Catalytic poisons include silicon or sulphur based compounds e.g. silicon based: furniture polish, electrical contact releasing sprays and lubricants, like WD40.

VESDA ECO uses catalytic beads with integral filters to ensure the longest possible operating life.

Infrared sensing elements should also operate for several years, typically greater than five and possibly ten.

Gas name	Chemical Formula	Detection Range	Detection principle	Typical sensor life
Ammonia	NH_3	0-100 ppm	Electrochemical cell	18 to 24 months *
Carbon Monoxide	CO	0-500 ppm	Electrochemical cell	18 to 24 months
Chlorine	Cl_2	0-20 ppm	Electrochemical cell	18 to 24 months
Hydrogen	H_2	0-2000 ppm	Electrochemical cell	18 to 24 months
Hydrogen Sulphide	H_2S	0-100 ppm	Electrochemical cell	18 to 24 months
Nitrogen Dioxide	NO_2	0-10 ppm	Electrochemical cell	18 to 24 months
Oxygen	O_2	0-25% v/v	Electrochemical fuel cell	18 to 24 months
Sulphur Dioxide	SO_2	0-10 ppm	Electrochemical cell	18 to 24 months
Alcohols	NA	0-100% LFL	Catalytic bead / Pellistor	3 to 5 years
Ammonia	NH_3	0-100% LFL	Catalytic bead / Pellistor	3 to 5 years
Gasoline Vapours	NA	0-100% LFL	Catalytic bead / Pellistor	3 to 5 years
Hydrogen	H_2	0-100% LFL	Catalytic bead / Pellistor	3 to 5 years
Methane	CH_4	0-100% LFL	Catalytic bead / Pellistor	3 to 5 years
Pentane	C_5H_{12}	0-100% LFL	Catalytic bead / Pellistor	3 to 5 years
Propane	C_3H_8	0-100% LFL	Catalytic bead / Pellistor	3 to 5 years
Carbon Dioxide	CO_2	0-5% v/v	Infrared	> 5 years

Table 1: Gas type – sensing technology – typical sensor life
*Note: Those marked with an * assumes operation in atmospheres free of any background concentration of the target gas.*

Routine testing/calibration

To perform routine testing and calibration of VESDA ECO gas detectors you will need the following:

- A Microsoft Windows enabled laptop or PC
- Xtralis VSC configuration software. (Free download from the Xtralis partner website after registration)
- Cylinder of zero gas (clean air or Nitrogen)
- Cylinder of span / calibration gas (see Table 2)
- Flow regulator capable of delivering a flow rate of 0.5 litres / minute (1.0 l/m for Cl2) using 6mm (¼") outside diameter; 4mm (~1/8") inside diameter pipe for connecting the gas to the ECO calibration port
- Product manual calibration procedure.

Examples of calibration kit and flow regulator.

Will vary based on supplier.

The recommended test gas concentrations for each sensor type/measurement range are given in Table 2.

Gas Name	Chemical formula	Measurement Range	Factory Default Setting		Temperature Limit		Humidity Limit		Recommended Test Gas Concentration
			Pre Alarm	Alarm	Low	High	Low	High	
Ammonia	NH_3	0-100 ppm	6 ppm	9 ppm	-20°C	+40°C	15 %RH	90 %RH	50 ppm
Carbon Monoxide	CO	0-500 ppm	7 ppm	50 ppm	-20°C	+50°C	15 %RH	90 %RH	100 ppm
Carbon Dioxide	CO_2	0-5% v/v	0.5% v/v	1.5% v/v	-10°C	+50°C	10 %RH	90 %RH	2.0% v/v
Chlorine	Cl_2	0-20 ppm	0.1 ppm	0.3 ppm	-20°C	+40°C	10 %RH	90 %RH	5 ppm* (See note)
Hydrogen	H_2	0-2000 ppm	500 ppm	1000 ppm	-20°C	+50°C	15 %RH	90 %RH	1000 ppm
Hydrogen Sulphide	H_2S	0-100 ppm	1 ppm	2 ppm	-20°C	+50°C	15 %RH	90 %RH	20 ppm
Nitrogen Dioxide	NO_2	0-10 ppm	0.3 ppm	0.5 ppm	-20°C	+50°C	15 %RH	90 %RH	5 ppm
Oxygen Deficiency	O_2	0-25% v/v	20 % v/v	19.5% v/v	-20°C	+55°C	5 %RH	95 %RH	20.9% v/v
Oxygen Deficiency & Enrichment	O_2	0-25% v/v	19.5% v/v	22.5% v/v	-20 C	+55°C	5 %RH	95 %RH	20.9% v/v
Sulphur Dioxide	SO_2	0-10 ppm	0.3 ppm	0.5 ppm	-20°C	+50°C	15 %RH	90 %RH	5 ppm
Alcohols (IPA)	—	0-100% LFL	7 %LFL	12 %LFL	-20°C	+50°C	5 %RH	90 %RH	42 %LFL in Air†
Ammonia	NH_3	0-100% LFL	7 %LFL	12 %LFL	-20°C	+50°C	5 %RH	90 %RH	36 %LFL in Air††
Gasoline	—	0-100% LFL	7 %LFL	12 %LFL	-20°C	+50°C	5 %RH	90 %RH	46 %LFL in Air†
Hydrogen	H_2	0-100% LFL	7 %LFL	12 %LFL	-20°C	+50°C	5 %RH	90 %RH	50 %LFL in Air
Methane / Natural Gas	CH_4	0-100% LFL	7 %LFL	12 %LFL	-20°C	+50°C	5 %RH	90 %RH	50 %LFL in Air
Propane	C_3H_8	0-100% LFL	7 %LFL	12 %LFL	-20°C	+50°C	5 %RH	90 %RH	42 %LFL in Air†
Pentane	C_5H_{12}	0-100% LFL	7 %LFL	12 %LFL	-20°C	+50°C	5 %RH	90 %RH	50 %LFL in Air

Table 2: Gas Types, Measurement ranges and recommended test gas concentrations
Notes: (*) requires a gas flow at 1 litre per minute
(†) Cross-calibrated using 50% LFL Pentane (C_5H_{12}) in Air
(††) Cross-calibrated using 50% LFL Methane (CH_4) in Air

Zero calibration

Zero calibration of flammable gas sensors requires the use of clean air, e.g. ambient air without the presence of combustible gases, this can be referred to as "zero gas". Zero calibration of toxic gas sensors can be performed using zero gas or 100% v/v Nitrogen which is also referred to as "zero gas".

Zero calibration of Oxygen and Carbon Dioxide sensors also requires the use of an inert gas such as 100% v/v Nitrogen.

Span calibration

Span calibration is the setting of a detector to read the same concentration as supplied in a test/calibration gas cylinder.

Span gas concentrations are typically 50% of scale, but can be any concentration between 10% and 90% of scale.

Oxygen detectors

Span calibration of Oxygen detectors can be performed using ambient air provided it can be confirmed that no interference gases are present.

Calibration procedure

Refer to the VESDA ECO product guide for full details of the calibration procedure.

Toxic gas detectors

When calibrating toxic gas detectors, gas cylinders containing a known concentration of the target gas (typically 50% of the measuring range) should be used.

Flammable gas detectors

When calibrating flammable gas detectors, gas cylinders containing a known concentration of the target gas (typically 50% of the measuring range) should be used. However some flammable gases are either not available or unsuitable for storage in pressurised containers.

Under these circumstances it is possible to calibrate for the target flammable gas using an alternative flammable gas with the use of a correction factor See table two for more information.

Test/calibration/test gas cylinders

Test / calibration gas cylinders are available in most countries. To ensure ease of handling and reduce costs Xtralis recommend the use of small disposable aluminium alloy or steel cylinders with a gas capacity ranging from 34 to around 110 litres.

A flow regulator will be required to deliver a flow rate of up to 0.5 litres a minute. It should be possible to calibrate in excess of 12 sensors from a 34 litre cylinder and 40 sensors from a 110 litre cylinder at a flow rate of 0.5 litres / minute.

Cylinders regulations vary between countries and regions, check which regulations apply to your country before ordering. Alternatively the recommended suppliers listed below will be able to help.

- American gas cylinders comply with US Dot standards
- European gas cylinders comply with : EN12205

Note: Smaller 12 / 20 litre; aerosol type; canisters are not recommended due to their small capacity and the inability to accurately regulate the flow**.**

To ensure the accuracy of the calibration gas mixture, suppliers quote a shelf life for the cylinders contents. At the end of this life the accuracy of the contents can not be guaranteed. The typical shelf life for flammable calibration gas is 36 months and 12 months for most toxic mixes. Check with your suppler for exact details.

Calibration / test gas suppliers

If you are unable to source calibration test kits in your country, Xtralis has partnered with 3 regional suppliers, see contact details and product part numbers below.

Each of these suppliers can supply test gases globally, most have regional distributors which can often supply these gases at a reduced price due to their ability to consolidate consignments and ordering in bulk.

Contact any of these suppliers direct to learn of your nearest distributor.

Costs may vary between suppliers. We recommend alternative quotes are obtained covering price and delivery times.

The following table of supplier part numbers is supplied for reference purposes only. Check supplier part numbers and descriptions with any potential supplier before ordering or when cylinders of different gas mixtures are required.

Region	Europe & Middle East	Americas	Australasia & Asia Pacific
Supplier	Air Products PLC (Formerly Cryoservices) Warndon Business Park, Worcester, WR4 9RH, UK Tel +44(0)1905 758 200 Fax: +44(0)1905 457824 Email: oneuse@airproducts.com www.airproducts.com	Gasco 320 Scarlet Boulevard, Oldsmar, Florida 34677 USA Toll free: 800-910-0051 Local: 813-343-5631 Fax: 866-755-8920 Email: info@gascogas.com www.gascogas.com	CAC Gas & Instrumentation Unit 10, Junction Estate 2 Duck Street, Auburn, NSW Australia 2144 Tel: +61 (0)2 9735 8833 Fax: +61 (0)2 9735 8899 Email: cac@promtel.com.au www.cacgas.com.au
Gases and concentrations Cylinder capacity - gas litres	**110 Litre Disposable Aluminium alloy cylinders Part Numbers**	**103 Litre Disposable Steel cylinders Part Numbers**	**34,103 or 112 Litre Disposable Cylinders DA: Disposable Aluminium DS: Disposable Steel Part Numbers**
Ammonia (50 ppm) in Nitrogen (see note 1)	312680	103L-13-50	34DA50NH3N
Carbon Dioxide 2.0% in Nitrogen	312701	103L-35-2	103DS2CO2N
Carbon Monoxide (100 ppm) in Nitrogen	312043	103L-49-100	103DS100CON
Chlorine 5 ppm in Nitrogen (see note 1)	312937	116L-252-5 (116 L Aluminium alloy)	34DA5CL2N
Hydrogen (1000 ppm) in air	312153	103L-92-1000	103DS1000H2A
Hydrogen Sulphide (20ppm) in Nitrogen (see note 1)	312158	103L-98-20	112DA20H2SN
Nitrogen (100%)	197140	103L-114	103DSN
Nitrogen Dioxide (5 ppm) in Nitrogen (see note 1)	TBA	103L-111-5	34DA5NO2N
Oxygen (18%) in nitrogen	TBA	Not applicable	103DS18O2N
Oxygen (20.9%) in Nitrogen	312016	103L-1	103DS20.902N
Sulphur Dioxide (5 ppm) in Nitrogen (see note 1)	312734	103L-175-5	34DA5SO2N
Hydrogen 50% LFL in air (2.0% v/v)	312025	103L-85-2	103DS50H2A
Methane 50% LFL in air (2.5% v/v)	312030	103L-135A-2.5	Not applicable
Methane 50% LFL in air (2.2% v/v)	312049	Not applicable	103DS2.2CH4A
Propane 50% LFL in air (1.1% v/v)	Not applicable	103L-176-1.1	103DS50PA
Propane 50% in air (0.85% v/v)	312046	Not applicable	Not applicable
Pentane 50% LFL in air (0.7% v/v)	312155	103L-154-0.7	103DS0.7VC5H12A
Pentane 50% LFL in air (0.55% v/v)	Not applicable	Not applicable	Not applicable
LFL Values derived from	ISO 10156	NFPA 497	ISO 10156 2010

Note 1: Considered to be a reactive gas. Use Teflon tubing to deliver gas from cylinder to detector otherwise a low gas reading may result due to interaction between the test gas and tubing.

Accessories			
Test Kit including: Qty 1: 103L gas cylinder 103DS3GASXT1N (100ppm CO/2.2% CH4/20.9% O2 in N2) Qty 1: 103L gas (103DSN 100% N2) Qty 1: FF-100-.5 regulator Qty 1: CC-01 carry case 3 M tubing (see note 1)	Not applicable	Not applicable	103DSXTKIT1
Two cylinder carrying case	198258	CC-58-AL	CC-01
Regulator - 0.5 l/min Chrome plated or Nickel plated Brass (For all non relative gases)	186414	70-0.5 Includes 2 feet of tubing	FF-100-0.5
Regulator - 0.5 l/min Stainless steel (For reactive gases: Ammonia, Hydrogen Sulphide, Nitrogen Dioxide, Sulphur Dioxide)	197943	70SS-0.5 Includes 2 feet of tubing	FF-100-SS-0.5
Regulator - 1 l/min Stainless steel (For reactive gas: Chlorine)	197941	70SS-1.0 Includes 2 feet of tubing	FF-100-SS-1.0
Dial a flow regulator 0-5 l/pm	197929	Not applicable	VAF-100-5 0.5 to 5.0 l/min
Tygon tubing 6.0mm OD 4.0mm ID	198261	Not applicable	AEM02011
Teflon tubing for Ammonia and Chlorine 6.5mm (3/16") OD, 4.3mm ID x 100cm	198784	Not applicable	AJD00012

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